The Timing of Equity Issuance: Adverse Selection Costs or Sentiment?

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Abstract

This study constructs a two-step model to test the most prominent market timing factors. We decompose equity issuances into 1) firm-specific components, which are predicted by firms' characteristics, and 2) market-wide components, which are predicted by aggregate time series measures. Our evidence shows that, at the firm level, firms with higher market-to-book ratio, smaller size, more growth opportunities, and fewer tangible assets are more likely to issue equity. At the aggregate level, a greater proportion of firms issue equity in years with higher aggregate market-to-book ratio and lower asymmetric information. After controlling for the aggregate market-to-book ratio and information asymmetry, sentiment has no direct effect on equity issuance. This paper provides direct evidence that firms time their favorable market conditions to reduce adverse selection costs, and to exploit higher individual security valuations or capture growth opportunities.

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1. Introduction

Firms decide to issue equity for different reasons. From the firm-specific side, firms issue equity to raise capital for operating, expanding, or financing investment opportunities. Alternatively, firms issue equity to reduce (or to avoid increasing) debt to reduce bankruptcy costs. From a market-wide perspective, equity issuance decisions can indicate an attempt to take advantage of favorable market conditions. Of course, both reasons might apply.

It is seen that the number of firms issuing equity and the dollar value of these issues varies greatly over time. Based on the data of US stock market from 1963 to 2014, over 30% of all firms issue equity in some years, and this percentage might fall below 5% in other years. The same goes for the value of issues when we look at the US stock market from 1963 to 2014: in some years the value of equity issued as a fraction of outstanding assets exceeds 3.2%, while in other years this percentage is below 0.3%. One widely accepted explanation for the large intertemporal variation in equity issuances and issue volumes is that firms tend to time their issues based on favorable market conditions.

Market timing in the traditional sense hypothesizes that firms take advantage of a favorable market value of equity to issue more equity. Hence, individual security valuation plays a significant role in financial decisions. When their market value is higher than the book value or past market value, firms are more likely to issue equity, and when market value is lower than book value or past market value, firms are more likely to repurchase equity (Asquith and Mullins, 1986; Jung, Kim and Stulz, 1996; Baker and Wurgler, 2002).

What drives market-to-book values? One commonly cited factor is investor irrationality (Delong, Shleifer, and Waldmann, 1990; Shleifer and Vishny, 1997;

Shleifer, 2000; Baker and Wurgler, 2006). This factor is drawn from behavioral finance. Investor sentiment relates to an estimate of future cash flows and risks that are not based on reality. Shleifer and Vishny (1997) believe betting against sentimental investors is costly and risky, so classical rational investors are not always capable of pushing or pulling stocks prices completely back to their fundamental values. Thus, investor sentiment has the power to affect stock prices. These effects can push stock prices further away from fundamental values, affect market-to-book ratios, and finally affect equity issuances. While it is commonly believed that investor sentiment drives equity issuances, to our knowledge, there is little or no direct evidence about the effect of sentiment on equity issuances.

There are two main classes of measures for sentiment: those based on market data and those based on surveys. Some authors use the volume of equity issuance as a measure or proxy for sentiment. Periods of high IPO and SEO volumes are often referred to as 'hot' equity or high sentiment periods. For instance, Allen and Faulhaber (1989), Ritter (1991), Baker and Wurgler (2000), Ritter and Welch (2002), Loughran and Ritter (2003), Ljunggvist, Nanda and Singh (2006), and Cornelli, Goldreich and Ljunggvist (2006) suggest that equity issues as a fraction of total issues might indicate periods of high sentiment. In this paper, we are especially interested in Baker and Wurgler (2006) sentiment index, which is based on common variation of six underlying proxies for sentiment.

We are not aware of any study that directly tests the effect of Baker and Wurgler's sentiment index (or similar indices) on equity issuances. As far as equity issuances are concerned, the indirect measure of sentiment is non-testable: sentiment and equity issues are one and the same. This measure has been mainly used to test equity returns. For instance, Baker and Wurgler (2000) suggest that equity issues as a fraction of total issues could predict future returns. The rationale behind this argument is that sentiment drives security valuation and causes firms to issue equity (as opposed to issuing debt). As a result, firms that issue equity during these periods experience lower future returns.

Firms might time market conditions to reduce adverse selection costs. As in the case of sentiment, previous research has used indirect measures of adverse selection costs that are problematic. For instance, Choe, Masulis, and Nanda (1993) suggest that adverse selection costs are lower during periods of expansion. Hence, the authors denote expansionary periods as an indicator of lower adverse selection costs. Again, in this setting, direct tests of the effect of adverse selection costs on equity issuances are not possible. The authors conclude that firms that issue equity during expansionary phases face less severe negative market reaction and that this could be attributed to lower adverse selection costs.

Until now there is no clear evidence on whether sentiment or adverse selection costs directly affect equity issuances, let alone whether both operate in the same multivariate setting. Authors primarily rely on future stock returns (or announcement day abnormal returns) to argue that these issuances might have been conducted during periods of high sentiment or low adverse selection costs. The level of equity issues is used to indicate investor sentiment, which is especially problematic since equity issues are never exogenous. Apart from the market and economy-wide factors, firm characteristics affect equity issues as well. This study first uses firm characteristics to predict individual firms' propensities to issue equity and compares these with actual issuances. The residual propensity to issue, which is the difference between actual proportion of equity issuing firms and the aggregate predicted propensity of firms to issue equity, measures the portion of equity issuance that cannot be explained by the needs of firms for investment or financial restructuring purposes. This residual is then regressed on time series measures of adverse selection costs and investor sentiment. Thus, we decompose equity issues into firm-specific and market-wide components. Also, we also run competing tests between adverse selection costs and investor sentiment.

The results of this study show that from firm-specific view firms with higher market-to-book ratio, lower profitability, smaller size and more growth opportunities

are more likely to issue equity; whereas from a market-wide perspective a greater proportion firms issue equity (beyond what is explained by firms characteristics) in years with higher aggregate market-to-book ratios and lower adverse selection costs. However, after controlling for the aggregate market-to-book ratio and adverse selection costs, investor sentiment and business cycle factors do not directly affect equity issuance decisions. The empirical evidence indicates that firms time their financing decisions with favorable market conditions. Firms tend to take advantage of security overvaluation or growth opportunities by issuing equity when the aggregate market to book ratio is relatively high. Similarly, firms tend to take advantage of reduced information asymmetry by issuing equity when the aggregate market synchronicity is relatively low.

The remainder of the paper is organized as follows: In Section 2, we go through capital structure theory and market timing papers. Data and methodology are explained in Section 3. Empirical results are in Section 4. Robustness tests are shown in Section 5. Our conclusions are given in Section 6.

2. Related Literature Review and Hypotheses Development

2.1 Literature Review

2.1.1 Capital Structure Theories

Modigliani and Miller (1958) argue that the value of a firm is not dependent on its leverage. Modigliani and Miller (1963) take tax into consideration, which creates tax shield effects. Optimal leverage can be achieved by weighing the trade-off between tax benefits (tax shield) and debt costs (agency costs and bankruptcy costs), as stated by Jensen and Meckling (1976). Myers (1984) and Myers and Majluf (1984) argue that there is no optimal leverage for a firm but an order of financing choice. Because of the adverse selection costs, firms should follow a financing hierarchy: retained earnings are the best way, and then comes external debt, and equity is the last source. However, Fama and French (2005) show firms' financial decisions usually violate the pecking order theory.

Additional empirical evidence shows classical theories cannot fully explain financial decisions. For instance, Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) state financing decisions are more associated with internal deficits than with deviation from optimal leverage. Thus, some new theories or explanations are needed.

2.1.2 Market timing

Many empirical evidences show firms tend to time the market to take advantage of favorable market conditions. It is a common phenomenon in the market. Loughran, Ritter and Rydqvist (1994) and Rajan and Zingales (1995) document this market timing phenomenon in worldwide. Welch (2004) states that past stock prices have strong effects on capital structure, which indicates market timing exists. Chichti (2010) gives the empirical evidence that equity market timing has persistent effects on leverage. Graham and Harvey (2001) show a survey result that two-third of CEOs admit that they issue equity relative to their stock prices.

Market timing means that firms take advantage of favorable market conditions.

Individual equity valuation plays a significant role as an indicator of the market conditions. Market-to-book ratio is taken as a proxy for individual valuation or growth opportunity of firms. Higher market-to-book ratio might be interpreted as being overpriced, and lower market-to-book ratio is taken as being undervalued. Firms are more likely to issue equity when they realize their firms are overvalued and repurchase the equities when stocks are undervalued. Baker and Wurgler (2002) state that market-to-book ratio can reflect stock valuation, and past cumulative market-to-book ratio has a strong and persistent effect on the current capital structure. Elliott, Koeter-Kant and Warr (2008) find market-to-book ratio has a significant explanatory power and plays a major role in the financial choice decision. However, Hovakimian (2006) states equity issuance timing does not have persistent effects on the current leverage. Most empirical results show firms are more likely to issue equity with higher market-to-book ratio or higher stock prices, and more likely to repurchase equity with lower market-to-book ratio or lower stock prices. Higher market-to-book ratio is the indicator for favorable market conditions and is used by managers in financing decisions.

On the other hand, some studies take market-to-book ratio as a proxy for growth opportunity instead of stock valuation. Higher market-to-book ratio suggests more growth opportunities, and lower market-to-book ratio suggests fewer growth opportunities. The effect on equity issuances is similar to valuation interpretation in such a way that firms with more growth opportunities are more likely to issue equity, and firms with fewer growth opportunities more likely to repurchase equity. Firms raise money by issuing equity when they foresee more growth opportunities and issue less when they lack growth opportunities.

Investor sentiment is also taken as a sign of the market condition. This explanation is based on the behavioral finance assumptions. The first assumption, as stated by Delong, Shleifer, Summers, and Waldmann (1990), is that investors are subject to sentiment. Investor sentiment is defined as an estimation of future cash flows and risks that does not depend on fundamentals. The second assumption, as stated by Shleifer

and Vishny (1997), is that arbitrage is costly and risky, which indicates that arbitrage activities are limited in the real market. Moreover, even rational arbitrageurs are not so aggressive in pushing or pulling stock prices back to their fundamentals as assumed in classical studies. In this case, investor sentiment might affect prices valuations, and predict market conditions. Finally, investor sentiment affects equity issuances by affecting stock valuation. Baker and Wurgler (2006) provide evidences that investor sentiment could affect stock prices. Barberis, Shleifer, and Vishny (1998), and Hirshleifer, and Subrahmanyman (1998) use a "bottom up" approach to predict investor sentiment, and show how this sentiment affect past returns and fundamentals. In our paper, we use Baker and Wurgler (2006) sentiment index, which is based on the common variation in six underlying proxies for sentiment.

2.1.3 Adverse selection costs hypothesis

Adverse selection cost hypothesis has quite a long history, which can start from Myers (1984) pecking order theory. Different from behavior finance, this explanation assumes investors are rational, and information asymmetry exists between inside managers and outside investors. It causes information costs and higher capital costs when firms decide to issue equity instead debt. Adverse selection costs make issuing equity a more costly source of financing for firms. Firms are only likely to issue equity when they capture lower information asymmetric period, which has lower adverse selection costs, to avoid high capital costs. According to Lucas and McDonald (1990) adverse selection costs vary over time. Korajczyk, Lucas and McDonald (1991) find that firms are more likely to issue equity after information release, which could reduce information asymmetry. Bayless and Chaplinsky (1996) and Korajczyk, Lucas and McDonald (1991) state that managers avoid issuing equity during high periods of asymmetric information. Alti (2006) provides that firms are more likely to issue equity during hot market compared with the cold market.

Roll (1988) states that the extent to which firm-level and market-level information is capitalized can be reflected in stocks co-movement. Stock returns variation includes

market-level and firm-specific information. The more firm-specific information is impounded into the stock price, the lower information asymmetry exists. Morck, Yeung and Yu (2000) and Kan, Morck and Yang (2004) use asset pricing model to capture stock return variation residual, which is a proxy for synchronicity. Higher R^2 indicates higher synchronicity. When synchronicity is high, stocks tend to move up and down together, implying that less firm-specific information exists in the market. Frankel and Li (2004) set a model to predict cross-sectional R^2 and find that R^2 is a reliable proxy as a measure of information asymmetry (adverse selection costs). Piotroski and Roulstone (2004), Durnev, Morck, and Yeung (2003), Wurgler (2000), and DeFond and Hung (2004) provide evidences that lower stock return synchronicity firms have higher level of firm-specific information priced in the stock price, which is consistent with previous studies that stock return synchronicity can be stated as a benchmark to measure the level of information asymmetry. In summary, lower stock returns synchronicity indicates greater firm-specific information is capitalized in stock price, less information asymmetry in the market, and less adverse selection costs.

2.2 Hypotheses

From the irrational view, market timing phenomenon can be explained by investor sentiment. If managers take sentiment into consideration in financial decisions, after controlling for firms' characteristic, we should still capture an effect of sentiment on equity issues.

Hence, we hypothesize the following:

Hypothesis 1: *Investor sentiment is significantly and positively associated with equity issuance residual propensity.*

From the rational view, market timing can be seen as an attempt to capture the favorable market condition to avoid high information costs (adverse selection costs). In order to prevent high capital cost, firms might avoid issuing equity or issue more debt during high costs period. Lower adverse selection costs indicate a favorable market condition, and managers take advantage of this opportunity by issuing more equity.

Stock price synchronicity is used as a proxy for adverse selection cost in this paper. Years with higher weighted price stock synchronicities are taken as periods of high adverse selection costs. Thus, firms should be more likely to issue equity when adverse selection costs are lower, and vice versa.

Hence, we hypothesize the following:

Hypothesis2*: Stock price synchronicity is significantly and negatively associated with equity issuance residual propensity.*

Generally, during expansionary phases of the business cycle, capital cost is lower. The market is more active, and more investment opportunities are presented to the market. Firms will raise more money to capture these investment opportunities or lower capital costs. We posit that firms are more likely to issue equity during expansionary phases of the business cycle.

3. Data and Methodology

3.1 Data and Sample

Data in this paper is collected from several databases. Basic financial fundamental data is acquired from Compustat. Stock returns and market index returns are collected from the Center for Research in Security Prices (CRSP). Investor sentiment index is taken from Baker and Wurgler website. Business cycle indicators are provided by Economic Cycle Research Institute (ECRI) website. Interest rates of 1-year-constant maturity Treasury bonds are collected from the Federal Reserve Bank of St. Louis.

The sample consists of US firms on Compustat and CRSP for the period from 1963 to 2014. Following previous studies, financial firms (SIC 6000-6999) and utility firms (SIC 4900-4999) are excluded. Firms with missing variables and negative assets are excluded. The final sample contains 115,497 firm-year observations.

3.2 Variables

Variable definitions and constructions are presented in Table 1. Following Baker and Wurgler (2002), *Net Equity Issue* is defined as changes in book equity minus changes in balance sheet retained earnings divided by total assets. To estimate the yearly equity issuance, we use several fundamental variables that affect issuance decisions.

Profitable firms might issue debt with fewer costs, so profitability might be negatively associated with equity issuance decisions. However, higher profits increase firms' financial slacks, which might reduce the need for external funds. Even though the effect is not clear, previous studies have found strong effects between profitability and debt or equity issuance decisions. Bayless and Chaplinsky (1991) find ROA negatively affects debt issuance, and Pagano and Panetta (1998) find a positive association between profitability and equity issuance. And other studies, such as Baker and Wurgler (2002), Korajczyk and Levy (2003), Hovakimian (2001, 2006), Elliott and Johanna (2008), Titman (2008), Titman and Wessels (1988), and Frank and Goyal (2009) all show important role of profitability in financing decisions. We use EBIT divided by total asset and EBITDA divided by total asset as proxies for profitability.

Studies find that larger firms tend to have more debt and more transparent assets. They usually issue more debt because of low fixed costs of debt. Many studies have provided consistent results. Rajan and Zingales (1995), Hovakimian (2001, 2006), Baker and Wurgler (2002), Fama and French (2002), Korajczyk and Levy (2003) and Flannery and Rangan (2006) all document positive effect of firm size on debt issue. Following these previous studies, we use the log of total assets and sales as proxies for firm size. Following Fama and French (2002), we also control for leverage in the model. All else being equal, firms with higher leverage are more likely to issue equity.

Previous studies also find tangibility has the same effect as the firm size on debt issuance decisions. Tangible assets could be used as collateral and are usually associated with the capability to bear more debt. Thus, firms with more tangible assets tend to issue debt, and firms with more intangible assets prefer equity instead. We use property, plant and equipment divided by total assets as a proxy for tangibility.

Bayless and Chaplinsky (1991) find leverage is negatively associated with debt issuances. Elliott and Johanna (2008) state that firms would like to move towards their target leverage in a long-term run. If the leverage of a firm is lower than its target, the firm is more likely to issue debt. Titman (2008) confirms this conclusion. We use two different definitions for leverage. Following Baker and Wurgler (2002), leverage is defined as total assets minus book equity divided by total assets. The second definition is long-term debt divided by total assets.

Some studies, including that of Baker and Wurgler (2002), take market-to-book ratio as a proxy for security valuation. Fama and French (2002) further state that the market-to-book ratio has a significant effect on leverage. Frank and Goyal (2009) consider it as a proxy for the investment opportunity. In this paper, we take market-to-book ratio as a proxy for either stock valuation or growth opportunity. We do not distinguish between the two. We use capital expenditure as a proxy for the investment opportunity. Higher capital expenditures indicate more investment opportunities and more need for external funds. We also use selling, general and administrative expense

as another proxy for investment opportunities for robustness tests.

Growth is associated with financing decisions. As Titman and Wessels (1988) and Fama and French (2002) contend, firms with more growth opportunities are more likely to raise capital. In these paper, the percentage change in total assets is used as a proxy for growth. Some papers use capital expenditure divided by total asset as a proxy for growth.

Some studies also find previous stock returns have an effect on current financing decisions (Bayless and Chaplinsky (1991), Welch (2004), and Titman and Tsyplakov (2007)). Thus, we also control for previous year's stock returns in some regression models for robustness tests.

3.3 Methodology

Many factors have persistent and significant effects on equity issuances. Following Fama and French (2002), Frank and Goyal (2009), Titman and Wessels (1988) and other studies, we selected some widely-accepted firm-specific characteristics that firms take into consideration in financial decisions. We selected a base period and estimated the average coefficients. Then we predict the propensity to issue for the forecast period using the average coefficients. The difference between the actual and predicted issuances is termed residual propensity to issue. Then we test several market timing factors on the residual propensity to issue. The details are in the following part.

3.3.1 Step I

Many previous studies have documented some firm-specific characteristics that persistently affect equity issuance. According to Frank and Goyal (2009), Titman and Wessel (1988), and Fama and French (2005) profitability, firm size, investment opportunities, tangibility, growth opportunities and leverage have strong and persistent effects on equity issuance. We set two models using those variables in Step I. One model is used in the main test, and the other model is used in the robustness test.

Step I-A is used to estimate equity issuance propensity. We choose a base period

1963 to 1977 and use these variables to run year-by-year logit regressions. Equity issue is the dependent variable. Dependent variable equals one if firm issue equity, and equals zero if not issue equity. We define equity issuance as net equity issuance divided by total asset larger than 5%, which follows Baker and Wurgler (2002) definitions for yearly equity issuance. Coefficient of each base period variable is estimated for each year. The coefficients of each variable then are averaged over the whole base period (in the spirit of Fama and MacBeth (1973)). Firm-level equity issuance probability is estimated by applying the average coefficient to the forecast period (1978 to 2014). By adding up all probabilities of all firms in a given year, we get the aggregate equity issuance. We observe a consistent and significant effect for each variable during 1963 to 1977. We also try with 1%, and 10% in the robustness tests thresholds to determine equity issuances. We also choose other base periods in the robustness tests.

The value of logit model prediction ranges from zero to one. The aggregate number is our predicted propensity to issue for each firm. Propensities for all available firms in each year are combined to obtain aggregate propensity for that year. Similarly, for each year, we aggregate the number of firms that actually issue equity. [1]This is our aggregate actual issue for that year.

Step I-B is used to calculate aggregate equity issuance residual. The difference between the aggregate actual and aggregate predicted issues is the yearly residual propensity. The resulting propensity is scaled by the total number of firms in that particular year. The value of scaled residual propensity ranges from -1 to 1.

$$Logit\ (Equity\ issuance) = \alpha+\beta_1 MB+\beta_2 EBIT\_TA+\beta_3 Ch\_TA\_TA+\beta_4 LogA \qquad (3.1)$$

"MB" is the market-to-book ratio. "EBIT_TA" is earnings before interest and tax divided by total assets, which is a proxy for profitability. "CH_TA_TA" is the percentage change of total asset divided by total asset, which is a proxy for growth opportunity. "LogA" is the log of total assets, which is a proxy for firm size. We used

[1] This process is the same as assigning values of ones for each firm that issues equity in that year. This is our actual issue value for each firm.

many combinations of firms' characteristics in the first step to estimate equity issuance propensity. In order to choose the most parsimonious model, we perform *t*-test for each variable following Fama and Macbeth (1973). Each variable is required to have both statistical and economic meanings to be included in the regression. After trying many combinations, we decide to set a model as Model (3.1). We also set a second model, which will be introduced it in Robustness test, to estimate equity issuance.

Our variables are defined in Table 1.

[Insert Table 1 here]

We also use different ways to calculate residual to issue. We summarize them in Table 2.

[Inset Table 2 here]

3.3.2 Step II

From Step I, we get the residual propensity to issue equity. In Step II, we test the effects of several market timing factors: market-to-book ratio, adverse selection costs, and investor sentiment on equity issue residual by controlling for business cycle and general capital costs. We define aggregate time-series market-to-book ratio as average market-to-book ratios of all firms in a given year, weighted by market value of each firm. Aggregate time-series stock price synchronicity is a proxy for time-varying adverse selection cost. Following French and Roll (1986), Roll (1988), and Morck et al. (2000) we define the synchronicity with the following model:

$$R_{it}=\alpha_{it}+\beta_{it}*R_{market,t} \qquad (3.2)$$

We regress monthly stock return on market return and calculate R^2s of the regressions. Firm-year observations without full 12 months records are excluded. The regressions are run for each firm for each year from 1963 to 2014. In order to get yearly R^2, we weight firm-year R^2 by Total Sum of Squares:

$$R_t^2=\frac{\sum_i R_{it}^2\times SST_{it}}{\sum SST_{it}} \qquad (3.3)$$

R^2 is defined as following:

$$R^2 = \frac{market-wide\ variation}{firm-specific\ variation + market-wide\ variation} \quad (3.4)$$

So the lower R^2 indicates more variation in firm-specific variation and less synchronicity.

Following Morck (2000), we calculate yearly stock price synchronicity as

$$Synchronicity_t = Log\left(\frac{R^2}{1-R^2}\right) \quad (3.5)$$

Our yearly R^2 is shown in Figure 1 and synchronicity is shown in Figure 2. Yearly R^2 varies a lot over years, which indicates information asymmetric levels changes over year. Synchronicity changes in the same direction with yearly R^2. Some years with lower synchronicity are considered as good market timing as stated in previous studies.

[Insert Figure 1 here]

[Insert Figure 2 here]

We regress aggregate market-to-book ratio, synchronicity, and investor sentiment on residual to issue during the period 1978 to 2014, excluding our base period (1963 to 1977).

We choose one-year Treasury bill rate as a measure of general capital costs. We posit that T-bill rate would have a significant and negative effect on equity issuances. The higher general capital costs, the less likely firms are to issue equity. We also control for the aggregate market-to-book ratio, synchronicity, and investor sentiment as the main independent variable to see whether the result is consistent with the hypothesis. We test three kinds of business cycle indicators: combined leading indicator, combined lagging indicator, and combined coincident indicator. Leading indicators change before the actual business cycle trend, lagging indicators follow the business cycle trend and the coincident indicators with the business cycle trend.

Our model is stated as:

$$Aggregate\ residual\ propensity = \beta_1\, aggregate\ time\text{-}series\ M/B + \beta_2\, aggregate\ time\text{-}series\ stock\ price\ synchronicity + \beta_3\, Sentiment\ Index + \beta_4\, Business\ cycle\ indicator + \beta_5\, T\text{-}bill\ rate \quad (3.6)$$

4. Empirical Results

4.1 Summary Statistics

Our sample covers data ranging from 1963 to 2014 and excludes financial firms (SIC 6000-6999) and utility firms (SIC 4900-4999) as well as the firms that have missing data and negative asset values. Summary statistics of variables used to estimate equity issuance are presented in Table 3. The observation is 115014. Average firm size is 4.4 measured by the log of total asset. Average market-to-book ratio is 1.76, and average profitability is 0.033 measured by EBITDA divided by total assets.

[Insert Table 3]

Correlations are presented in Table 4. Most variables are correlated with each other, and the correlations are relatively small, except for correlation between T-bill rate and aggregate market-to-book ratio.

[Insert Table 4]

4.2 Logit regressions

Table 5 summarizes Step I logit regressions that estimate the market-to-book ratio, profitability, firm size, and growth opportunities on the likelihood that a firm issues equity.

Our main base period ranges from 1963 to 1977. We also try different base periods including 1973 to 1982, 1963 to 1982, and 1973 to 1987 in robustness tests. Model (3.1) and Model (3.2) both show that firms with higher market-to-book ratios are more likely to issue equity; the average slope on MB during 1963 to 1977 is 0.24, and the *t*-value is 46.6. This result is consistent with previous studies (Baker and Wurgler, 2002). Higher market-to-book ratio indicates that individual security is overpriced, or that the firm has more growth opportunities. Firms issue equity with higher market-to-book ratio can exploit this good timing to gain more profits or raise more capital for the growth opportunities.

Empirical results in Model (3.1) show that profitable firms are less likely to issue

equity; the average coefficient is -7 during 1963 to 1977. However, most results from Model (3.2) show that profitable firms are more likely to issue equity. Previous studies have no consistent result about the effect of profitability on capital structure. Profitable firms need less external capital that they have enough internal funds for daily operation and for capturing investment opportunities. However, the relationship between profitability and capital structure is more complex (Frank and Goyal, 2009).

Model (3.1) and Model (3.2) provide consistent results regarding the effect of firm size on equity issuance that larger firms are less likely to issue equity. Larger firms have better reputation and face lower default risk so that they are expected to have more debt. Thus, we observe a negative sign for firm size. We use percentage change of total assets as a proxy for growth opportunity in Model (3.1) and use capital expenditure divided by total asset as a proxy for growth opportunity. Both proxies indicate that firms with more growth opportunities issue more equity. Such firms may be riskier, so it is harder for them to issue debt. Thus, we predict that growing firms are more likely to issue equity to finance. Tangibility is negatively associated with equity issuance. Firms with more tangible assets can raise debt at lower costs. Thus, they use debt more than equity.

All coefficients pass *t*-tests and are economically meaningful. Coefficients during different periods of each variable are consistent.

Our estimated coefficient during three periods and their *t*-statistics are shown in Table 5.

[Insert Table 5 here]

4.3 Estimates for equity issue residual propensity

The actual equity issuance, our estimation of equity issuance, and the residual propensity to issue for each year are shown in Figure 3.

[Insert Figure 3 here]

Estimated equity issuance changes a lot over time. It appears that equity issuance trend has a cycle. It keeps going up for about two years, and is followed by a downward trend for two years. For example, equity issuance went up from 1992 to 1994, and went

down from 1994 to 1996. The period from 1992 to 1996 can be seen as a cycle. Several similar cycle can be seen in the following period. Equity issuances dramatically declined in 2008, which may be attributable to the subprime crisis, and our estimation of equity issuance successfully captures this downward trend in 2008. We can also observe many similar trends with actual equity issuance and estimated issuance. Thus, we get a consistent estimate of the residual propensity. The similar pattern indicates our model captures consistent effects of firms' characteristics, and that the residual propensity cannot be explained by firm-specific reasons anymore, and some more factors are needed.

4.4 What factors really matter in market timing

We regress residual propensity to issue on aggregate market-to-book ratio, business cycle indicators, investor sentiment indicator, T-bill rate, and synchronicity. Results are shown in Table 6.

[Insert Table 6 here]

Step II captures actual important factors in market timing. Our results show synchronicity and aggregate market-to-book ratio are significantly associated with the residual propensity to issue. Firms are more likely to issue equity during periods of lower adverse selection costs. When synchronicity is higher, there is less firm-specific information priced in the stock, and higher adverse selection costs exist. At this time, firms avoid issuing equity. This result is consistent with static pecking order theory. Managers realize a favorable market condition by capturing the signs of lower adverse selection costs and try to take advantage of this opportunities by issuing more equity. By testing with a new methodology, we provide a more reliable evidence that directly proves rational assumption of market timing.

Aggregate market-to-book ratio shows significant and positive effects on the residual propensity to issue. Firms exploit good market conditions, and individual valuation is a very important factor in the decision process. Higher market-to-book ratio indicates a better market condition, and managers do take this into consideration in

making equity issue decision.

When we add investor sentiment into regression, we observe sentiment has no significant effect on residual propensity to issue. Our first hypothesis is rejected. Previous studies, such as Baker and Wurgler (2006), provide evidence that sentiment has strong effects on stock returns or prices, and thus affect stock valuation. This effect on stock valuation might change market-to-book ratio and finally affect equity issuance. However, after controlling for aggregate market-to-book ratio and synchronicity, sentiment has no significant direct effect on residual propensity to issue. Managers time the market to take advantage of favorable market conditions based on the market-to-book ratio and adverse selection costs but not directly on sentiment itself.

Some studies, including that of Choe et al (1993), provide evidence that firms are more likely to issue equity in hot market during expansion period and are less likely to issue equity during contraction period. We regress residual propensity to issue on business cycle indicators: leading indicators, lagging indicators and coincident indicators. Our empirical results show that after controlling for market-to-book ratio and stock adverse selection costs, business cycle indicator does not matter in equity issue decisions.

Previous studies provide two perspectives to explain the market timing. Rational view states that managers measure market timing to reduce adverse selection costs. Our results support this view. Irrational view believes sentiment affect stocks prices, stock valuation, and finally the equity issuance. However, our results show sentiment does not play a major role in the residual propensity to issue after controlling for market-to-book ratio and synchronicity. The horse race between rational adverse selection costs and irrational sentiment come to a conclusion that adverse selection costs play a more important role in market timing than sentiment does.

5. Robustness tests

We set a model to estimate aggregate equity issue residual propensity to issue in step I. to check if our model and tests are reliable, we provide many different ways to estimate the Step I and redo the second stage tests based on our estimations. We use the following model in the first step.

$$Logit\ (Equity\ issuance) = \alpha+\beta_1 MB+\beta_2 EBITDA\_TA+\beta_3 Ch\_TA+\beta_4 LogA+ \beta_5 CapEx+\beta_6 Lev \quad (5.1)$$

We perform *t*-tests for each variable during different periods as shown in Table 5. All coefficients are significant and meaningful, which provides a reliable estimation for equity issuance. Variables details are discussed in the methodology section.

Our first robustness test is based on Model (5.1) with the base period 1963 to 1977. Net equity issuance dummy takes on the value of one when the value of net equity issues scaled by total value of assets higher than 5%, zero otherwise. The entire process is similar to the one we did in the main test, and empirical results are shown in Table 7.

[Insert Table 7]

Our second robustness test is based on Model (5.1) with the base period 1963 to 1982. Net equity issuance dummy takes on the value of one when the value of net equity issues scaled by total value of assets higher than 5%, zero otherwise. The second step test starts from 1983 to 2014 as excluding tests. The process is similar to the main test. Empirical results are shown in Table 8. Results are consistent with the main tests.

[Insert Table 8]

Our third robustness test is based on Model (5.1) with the base period 1963 to 1977. Net equity issuance dummy takes on the value of one when the value of net equity issues scaled by total value of assets higher than 1%, zero otherwise. Results are shown in Table 9.

[Insert Table 9]

The last robustness test is based on Model (5.1) with the base period 1963 to 1987. Net equity issuance dummy takes on the value of one when the value of net equity

issues scaled by total value of assets higher than 1%, zero otherwise. Results are shown in Table 10.

[Insert Table 10]

All robustness tests have similar results to our main tests. Consistent results show that our conclusions are reliable. Aggregate market-to-book ratio is significantly and positively associated with residual propensity to issue. Higher market-to-book ratio associated with higher propensity to issue. Synchronicity has the significant and negative effect on the residual propensity to issue. After controlling for synchronicity, investor sentiment has no direct effect on residual propensity to issue. T-bill rate and business cycle do not have significant effects on residual propensity to issue after controlling for aggregate market-to-book ratio and synchronicity.

6. Conclusion

Firms tend to time the market conditions by taking advantage of favorable market conditions by issuing more equity. From the rational view, firms take adverse selection costs into consideration in their financial decisions. Our results provide direct evidence that managers time the market to reduce information cost, and adverse selection cost directly and significantly affects equity issuance. Lower adverse selection cost is considered as the favorable market condition that firms might issue equity at lower costs, and thus firms prefer to issue more equity. The period with higher adverse selection cost is taken as unfavorable market condition, and firms avoid issuing equity.

Irrational view for market timing phenomenon assumes that the investor sentiment might affect stock returns and prices, and finally affect equity issue. We test adverse selection costs and sentiment together in the model to compare these two factors. After controlling for aggregate market-to-book ratio and adverse selection costs, sentiment does not have a strong effect on residual propensity to issue. Our empirical results show that adverse selection cost is more important in the market timing decision than sentiment. Sentiment has no direct effect on equity issue.

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Appendix

Table 1-A Variables Definitions

Variable mnemonic	Name	Computation
BE	Book Equity	Total Asset [data6]-Total Liabilities [data181]-Preferred Stock[data10]+Deferred Taxes[data35]+Convertible Debt[data79].
BD	Book Debt	Total Asset[data6]-Book Equity[be]
BL	Book Leverage	Book Debt/Total Assets[data6]*100
ME	Market Equity	Common Shares Outstanding[data25]*Price[data199]
ML	Market Leverage	Book Debt/(Total Assets[data6]-Book Equity+Market Equity)*100
E	Net Equity Issues	Change in Book Equity-Change in Balance Sheet Retained Earnings[data36]
E_TA	Net Equity Issues	E/Total Assets[data6]
RE_TA	Newly Retained Earnings	Change in Retained Earnings[data36]/Total Assets[data6]
D	Net Debt Issuesd	Change in Total Assets-e-Change in Retained Earnings
D_TA	Net Debt Issuesd	D/Total Assets [data6]
MB	Market to Book ratio	(Total Assets[data6]-Book Equity+Market Equity)/Total Assets[6]
PPE_TA	Asset tangibility	Net Plant, Property and Equipment[8]/Total Assets[6]
EBITDA_TA	Profitability	Earnings before Interest, Taxes and Depreciation[data13]/Total Assets[data6]
LogA	Size	Log(Total Assets)
LogS	Size	Log(Sale)
DIV_BE	Dividends over Book Equity	Common Stock Dividends[data21]/Book Equity

Table 1-B Variables Definitions

Variable mnemonic	Name	Computation
DIV_ME	Dividends over Market Equity	Common Stock Dividends[data21]/Market Equity
DEP_TA	Depreciation Expense to Assets	Depreciation Expense[data14]/Total Assets[data6]
RD_TA	R&D to Assets	Research and Development[data46]/Total Assets[data6]
LEV	leverage	Long-term Debt/Total Assets
LEVEL	leverage	(Total Assets-BE)/Total Assets
SLACKS	slacks	Cash and Short-Term Investments/Total Assets
r	yearly returns	downloaded from CRSP
Ch_TA_TA	Growth opportunity	Percentage change of total assets divided by total assets

Table 2: Different ways to calculate residual propensity to issue equity

Different ways	definition
Model 2	**Logit (Equity issue) = MB+EBITDA_TA+PPE_TA+LogA+CapEx+Lev**
Residual 2	we treat E/TA bigger than 5% as equity issued, and choose base time period from 1963-1977
Residual 3	we treat E/TA bigger than 5% as equity issued, and choose base time period from 1963-1982
Residual 4	we treat E/TA bigger than 1% as equity issued, and choose base time period from 1963-1977
Residual 5	we treat E/TA bigger than 1% as equity issued, and choose base time period from 1963-1987

Table 3 Summary Statistics

This table presents summary statistics of the main independent variables for the Step I. The data range covers 1963 to 2014, and all the data is from COMPUSTAT and is winsorized at 0.01 level. MB is the market-to-book ratio. EBITDA_TA is the EBITDA divided by the total asset. We use it to measure the profitability of firms. PPE_TA is PPE divided by the total asset. We use it as the measurement of tangibility. LogA is the log of total asset, and LogS is the log of sales. We use these two variables to measure firm size. CAPEX is the ratio of capital expenditure to total asset. We use it as firm growth. Lev is Long-term Debt to Total Assets. XSGA is Selling, General, and Administrative Expense. Slack is Cash and Short-Term Investments/Total Assets. We use slack to measure cash flow conditions.

Variable	obs	Mean	Std.Dev	Min	Max
MB	102452	1.766	1.711	0.499	17.101
EBITDA_TA	115014	0.033	0.415	-3.774	0.434
PPE_TA	115351	0.304	0.235	0	0.919
LogA	115497	4.451	2.471	-1.796	10.424
LogS	112571	4.481	2.577	-2.733	10.3
CAPEx	113538	0.057	0.059	0	0.438
LEV	115462	0.172	0.202	0	1.114
XSGA	104079	213.72	704.301	0.079	1449.715
SLACK	115475	0.174	0.216	-0.269	1
EBIT_TA	115360	-0.019	0.429	-3.939	0.381
Ch_TA_TA	115497	-0.033	0.362	-2.288	0.87

Table 4 Correlations

This table presents correlation statistics of the dependent variables for the second step. aggmb is the aggregate market to book ratio, which is calculated by weighting each year's all market-to-book ratio by firm's market value. Synchronicity is the calculated following Morck (2002) to measure the adverse selection costs. Sentiment is investor sentiment. We got the data from Baker and Wurgler website. T bill ratio is the one-year Treasury bill rate. Lagging, leading, and coind the business cycle indictor. Then residual 1 is the independent variable.

	aggmb	synchronicity	sentiment	tbill	lagging	leading	coind	residual1
aggmb	1							
synchronicity	0.0186	1						
sentiment	-0.0088	-0.0394	1					
tbill	-0.6723	0.046	0.3075	1				
lagging	-0.1097	-0.1858	0.0624	0.1573	1			
leading	0.0675	-0.3411	-0.1093	-0.1369	-0.4543	1		
coind	-0.034	-0.3744	-0.0022	-0.0589	0.4833	0.3775	1	
residual1	0.559	-0.3877	0.4376	-0.5033	0.1174	0.0634	0.2746	1

Table 5 T-tests-Model 1

Logit regression to estimate coefficients for Model 3.1

We run logit regression year-by-year based on three time periods as shown in the table and average the yearly coefficients to get the average coefficients. The dependent variable is 1 if that during year firm issue equity, and 0 otherwise. The independent variables are market-to-book ratio, EBIT_TA (EBIT divided by total asset), LogA (log of total asset) Ch_TA_TA (the growth rate of assets). The following table shows the average coefficient for each variable during three time periods and t-statistics for the mean. We defined t-statistics, following Fama and MacBeth (1973), as the mean divided by its standard error (the times-series standard deviation of the regression coefficient divided by the square root of the number of years in the period).

	Average coefficient				
	Intercept	MB	EBIT_TA	LogA	Ch_TA_TA
1963-1977	-1.96***	0.24***	-7.01***	-0.09***	13.77***
1973-1982	-2.24***	0.33***	-5.43***	-0.07***	8.58***
1963-1982	-1.77***	0.27***	-6.11***	-0.09***	9.66***
1973-1987	-1.68***	0.3***	-5.53***	-0.06***	6.36***

Table 5 T-tests-Model 2

Logit regression to estimate coefficients: Model 3.2

We run logit regression year by year based on three periods as shown in the table and average the yearly coefficients to get the average coefficients. The dependent variable is one if year issue equity at that year, and zero otherwise. The independent variables are Market to book ratio, EBITDA_TA (EBITDA divided by total asset), PPE_TA (PP&E divided by total asset), LogA (log of total asset), CapEx (capital expenditure divided by total asset), and Lev (leverage, long-term debt divided by total asset). The following table shows average coefficient for each variable during three periods and *t*-statistics for the mean. We defined *t*-statistics, following Fama and MacBeth (1973), as the mean divided by its standard error (the times-series standard deviation of the regression coefficient divided by the square root of the number of years in the period)

	Average coefficient						
	Intercept	MB	EBITDA_TA	PPE_TA	LogA	CapEx	Lev
1963-1982	-2.76***	0.2***	0.59***	-1.01***	-0.03***	4.43***	1.22***
1963-1977	-2.97***	0.19***	0.73***	-1.21***	-0.02***	4.84***	1.55***
1963-1987	-2.4***	0.18***	0.43***	-1.11***	-0.04***	4.37***	1.04***
1973-1982	-2.74***	0.39***	-0.43***	-1.31***	-0.07***	9.67***	0.56***

Table 6 Regression results

This table presents the second step regression results. The second regression results from the regressing residual propensity to issue on aggregate market to book ratio and synchronicity. aggmb is the aggregate market to book ratio, and we use it to measure yearly cumulative valuation. Synchronicity is calculated from yearly r square, and we use it to measure yearly adverse selection costs. The third regression results from regressing residual propensity to issue on aggregate market to book ratio, synchronicity and investor sentiment. Investor sentiment is downloaded from Baker and Wurgler website, which measuring the investors prospect for the stock. The forth regression results from regressing residual propensity to issue on aggregate market to book ratio, synchronicity, investor sentiment and Treasury bill rate. The last column results from regressing residual propensity to issue on aggregate market to book ratio, synchronicity and coincident, which is the business cycle indicator. All the tests are adjusted with a *t*-test using Newey-West adjusted standard errors with lag 2.

Independent	(1)	(2)	(3)	(4)	(5)
aggmb	3.00821***	3.612581***	4.175977***	2.768282***	3.591177***
	.710177	.7361936	.8498681	.8154319	.753398
synchronicity		-4.567293***	-4.998165***	-4.030943***	-4.347071***
		1.857257	2.023497	1.799957	1.961306
sentiment			.5640711		
			1.174885		
tbill				-.3128924	
				.2165562	
coind					.0872198
					.2356012
N	37	37	33	37	37
data range	1978-2014	1978-2014	1978-2010	1978-2014	1978-2014

Table 7 Robustness Test- Residual 2

Dependent variable is residual 2. We use Model: Logit(issuance)=MB+EBITDA_TA+PPE_TA+LogA+CapEx+Lev with base time period 1963 to 1977 at 5% to estimate residual 2. “MB” is the market-to-book ratio. “EBITDA_TA” is the EBITDA divided by total assets. PPE_TA is the tangibility assets divided by total assets. “LogA” is the log of total assets. “CapEX” is the capital expenditures divided by total assets. “Lev” is the leverage. We use this model in the first step using the same process with main tests to estimate residual to issue. In the Step II, we test aggregate market-to-book ratio, synchronicity, sentiment, t-bill rate, and business cycle

residual2	(1)	(2)	(3)	(4)	(5)
aggmb	2.633102***	3.572348***	4.323088***	2.62231***	3.51459***
	.9546918	.884018	.9515534	1.061358	.9006599
synchronicity		-7.097975***	-7.806692***	-6.494453***	-6.503719***
		2.458452	2.686342	2.337404	2.575795
sentiment			.7518704		
			1.419998		
tbill				-.3520789	
				.294244	
coind					.2353574
					.2572417
N	37	37	33	37	37
data range	1978-2014	1978-2014	1978-2010	1978-2014	1978-2014

Table 8 Robustness Test- Residual 3

Dependent variable is residual 3. We use Model: *Logit (issuance)* = *MB+EBITDA_TA+PPE_TA+LogA+CapEx+Lev* with base period 1963 to 1982 at 5% to estimate residual 3. "MB" is the market-to-book ratio. "EBITDA_TA" is the EBITDA divided by total assets. PPE_TA is the tangibility assets divided by total assets. "LogA" is the log of total assets. "CapEX" is the capital expenditures divided by total assets. "Lev" is the leverage. We use this model in the first step using the same process with main tests to estimate residual to issue. In the Step II, we test aggregate market-to-book ratio, synchronicity, sentiment, t-bill rate, and business cycle

residual3	(1)	(2)	(3)	(4)	(5)
aggmb	1.436708*** .8192217	2.213492*** .8327283	2.97523*** .8512964	2.392841*** .9883159	2.192068*** .8236238
synchronicity		-3.796411*** 1.917867	-4.469116*** 2.377584	-3.806716*** 1.945449	-3.429108*** 1.952874
sentiment			1.9729 1.967588		
tbill				.0962786 .5702789	
coind					.1570626 .2051425
N data range	32 1983-2014	32 1983-2014	28 1983-2010	32 1983-2014	32 1983-2014

Table 9 Robustness Test- Residual 4

Dependent variable is residual 4. We use Model: *Logit(issuance)=MB+EBITDA_TA+PPE_TA+LogA+CapEx+Lev* with base time period 1963 to 1977 at 1% to estimate residual 4. "MB" is the market-to-book ratio. "EBITDA_TA" is the EBITDA divided by total assets. PPE_TA is the tangibility assets divided by total assets. "LogA" is the log of total assets. "CapEX" is the capital expenditures divided by total assets. "Lev" is the leverage. We use this model in the first step using the same process with main tests to estimate residual to issue. In the Step II, we test the aggregate market-to-book ratio, synchronicity, sentiment, t-bill rate, and business cycle

residual4	(1)	(2)	(3)	(4)	(5)
aggmb	1.784887***	2.761944***	3.41433***	1.908295***	2.694084***
	.9048206	.7700105	.8285212	.9520185	.7831457
synchronicity		-7.383715***	-7.939837***	-6.841426***	-6.685519***
		2.305469	2.556505	2.25832	2.41182
sentiment			.8666896		
			1.391073		
tbill				-.3163576	
				.2521686	
coind					.2765232
					.2301057
N	37	37	33	37	37
data range	1978-2014	1978-2014	1978-2010	1978-2014	1978-2014

Table 10 Robustness Test- Residual 5

Dependent variable is residual 5. We use Model: *Logit(issuance)=MB+EBITDA_TA+PPE_TA+LogA+CapEx+Lev* with base time period 1963 to 1987 at 1% to estimate residual 5. "MB" is the market-to-book ratio. "EBITDA_TA" is the EBITDA divided by total assets. PPE_TA is the tangibility assets divided by total assets. "LogA" is the log of total assets. "CapEX" is the capital expenditures divided by total assets. "Lev" is the leverage. We use this model in the first step using the same process with main tests to estimate residual to issue. In the Step II, we test the aggregate market-to-book ratio, synchronicity, sentiment, t-bill rate, and business cycle

residual5	(1)	(2)	(3)	(4)	(5)
aggmb	2.258692***	3.909064***	4.086619***	3.284291***	3.790126***
	1.02308	1.098049	1.008574	1.060923	1.083009
synchronicity		-5.636463***	-4.962052***	-6.21432***	-5.172445***
		1.223321	1.228331	1.472746	1.403821
sentiment			2.103647		
			1.640193		
tbill				-.4632222	
				.6347811	
coind					.0918208
					.2188787
N	25	25	23	25	25
data range	1988-2014	1988-2014	1988-2010	1988-2014	1988-2014

Figure 1 Yearly R Square.

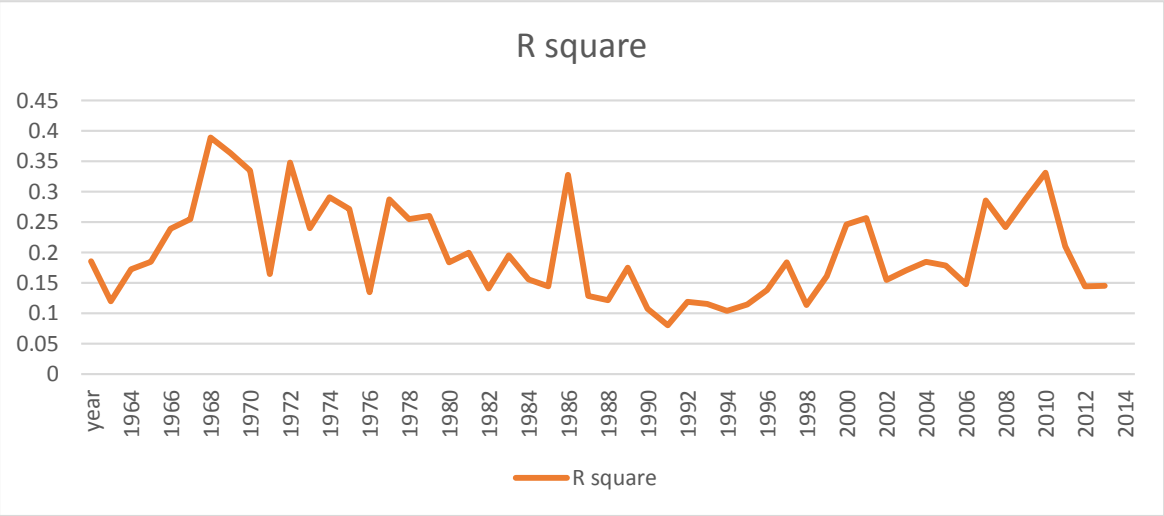

Figure 2 Yearly synchronicity

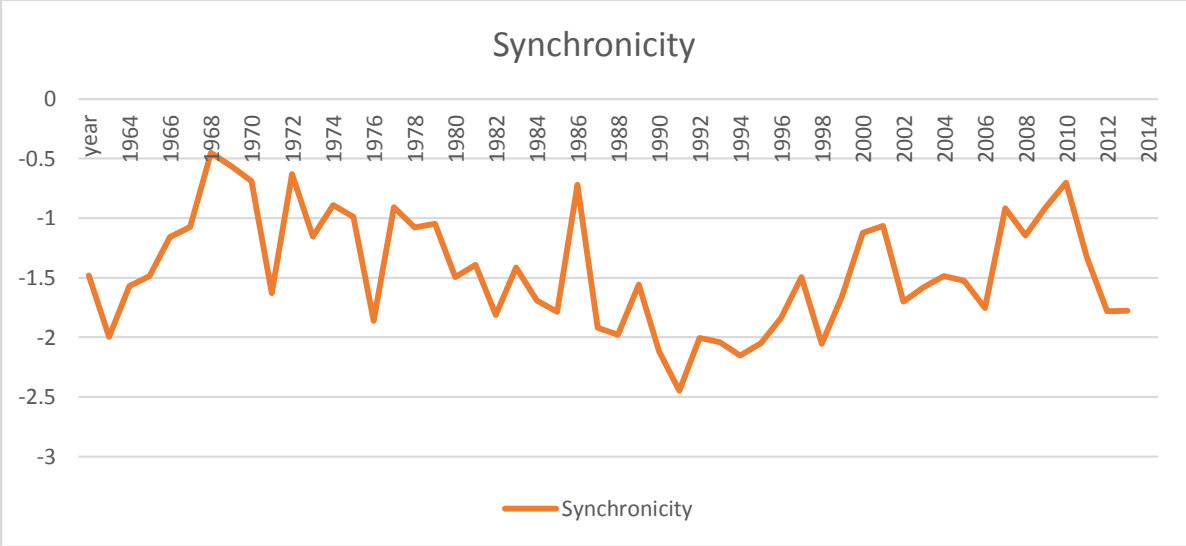

Figure 3 Residual propensity to issue Equity